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Biocorona of polymeric nanovesicles affects the therapeutic outcome of nanomaterials

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Polymeric nanovesicles are gaining an increasing interest in the field of drug delivery due to their multifaceted properties in terms of drug delivery. In particular, the diblock copolymer poly(dimethylsiloxane)-poyl(methyloxazolione) (PDMS-PMOXA), has the property to self-assemble in water or buffers, therefore, forming vesicular supramolecular nanocontainers. Furthermore, PDMS-PMOXA nanovesicles are an optimal candidate for the development of novel nanodrug delivery systems, as poly(dimethylsolixane) and poly(methyloxazoline) are FDA approved polymers. Indeed, polymeric nanovesicles are attractive nanomaterials due to their intrinsic stability, ease of chemical modification to achieve targeted drug delivery, and ability to load both hydrophobic and hydrophilic compounds. Despite, these intriguing features polymeric nanomaterials are facing challenges to enter in clinical trials compared to pegylated liposomes. The reason for this reluctant welcome on the nanodelivery market relies in the poor understanding of nanoparticles behavior in the biological environment. In this framework, a deep elucidation of the protein-particle interaction is fundamental to understand the nanovesicle half-life in the blood circulation. In addition, low nonspecific binding properties supported "stealth" features of the diblock copolymer rendering this drug delivery system comparable to pegylated liposomes. In this talk, I will present new studies performed on PDMS-PMOXA nanovesicles to elucidate the presence of the protein-particles interaction, also called biocorona, in biological fluids. The biocorona has been evaluated using several techniques ranging from dynamic light scattering to SDS-PAGE and Western Blot. In addition, investigation of different nanovesicles behavior towards cellular uptake has been investigated via fluorescent cell sorting analysis (FACS) and confocal laser microscopy. In conclusion, the chemical composition of diblock copolymer nanovesicles deeply affects the dynamic interaction between particles and plasma protein. For this reason, investigation using *in vitro* models regarding the behavior of polymeric nanodelivery systems in biological environment is of fundamental importance.

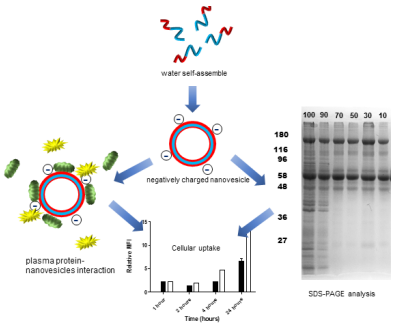

Figure : General scheme of polymeric nanovesicle synthesis and following analysis of protein interactions with the nanocarrier. Di-block copolymer PDMS-PMOXA is forming self-assemble nanovesicles in water environment. Different surface charges were measured depending on the chemical composition. In addition, the particle-protein interaction was studied using SDS-PAGE analysis and the consequent cellular uptake was evaluated using FACS analysis.

Biography

Fabiola Porta graduated in Chemistry at Leiden University, the Netherlands, in 2012 with thesis focused on the synthesis and characterization of silica mesoporous nanomaterials as drug delivery systems. In 2013, she joined University of Basel as a Research Associate in the field of Drug Delivery. At University of Basel, she is lecturing Bio-Nanomaterials in the Drug Delivery for Master of Drug Sciences students. In 2017, she was awarded the "Novartis University of Basel Excellence Scholarships for Life Science". She is now continuing her work on bio-nanomaterials as Principal Investigator in the Group of Biopharmacy of the Department of Pharmaceutical Sciences.

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